

DRAFT
Engineering Evaluation
Environmental Compliance Group, LLC
Plant No. 21239; Application No. 24345

Background

Environmental Compliance Group, LLC has applied for an authority to construct for soil remediation at the site located at 1440 23rd Street in San Pablo, California. Soil vapor extraction will be accomplished by means of a regenerative vacuum blower (S-1) with a maximum capacity of 300 scfm. The vacuum unit is also equipped with a water knockout vessel, inlet filter, dilution air valve, recirculation valve, and flow indicators. Vapors from air stripper (S-2) will be combined with S-1 vapors for treatment by abatement device A-1. Vapor abatement will be achieved by three different means of abatement processes: Thermal Oxidation (Therm-Ox); Catalytic Oxidation (Cat-Ox); and Carbon Adsorption (Carbon). These will be applied according to equipment availability. The Therm-Ox and Cat-Ox will be equipped with continuous temperature monitoring to ensure that BACT destruction efficiencies are met. The Carbon adsorption system will consist of two 200 pound minimum capacity activated carbon vessels connected in series.

The applicant will be conditioned to provide written notification at the start of each phase of abatement. Emission monitoring for operation of the Therm-Ox, and the Cat-Ox will be conducted according to established Source Test methodology. Procedures are outlined in the conditions found below. The carbon unit influent and effluent VOC concentrations will be monitored with a portable flame-ionization detector (OVA-FID) on a schedule reflecting current loading rates and predicted Carbon capacity. To ensure proper operation of equipment and verify attainment of steady-state conditions, Carbon performance will be monitored daily for the first five days. Environmental Compliance Group, LLC. may then elect to change their monitoring schedule based on measured influent concentrations and calculated carbon loading. Monitoring schedule changes will be allowed only after District review of concentration measurements and subsequent receipt of District approval.

This source is located within 1,000 feet of a school: Richmond High School/ Omega Continuation High, 1250 23rd Street, Richmond, CA 94804; therefore, this application requires Public Notification per District's Regulation 2-1-412. In addition, Salesian High School, located at 2851 Salesian Avenue, Richmond, CA 94804 and St. Paul Elementary School, located at 1825 Church Lane, San Pablo, CA 94806 are within one-quarter mile of the source and will be included in Public Notification.

Emission Calculations

S-1: Soil Vapor Extraction System

For a conservative estimate of yearly emissions, we shall assume that the system is operated for an entire year within an inlet concentration corresponding to the initial soil concentration level. Generalized assumptions follow:

- * Operating conditions: Pressure = 1 Atm; Inlet Temperature = 21°C; 1 mole occupies 24.15L
- * Molecular weight of TPHg = 100 g/mole (value for "weathered gasoline"). Molecular weight of Benzene = 78 g/mole.
- * Influent values based on operational parameters of equipment and applicant supplied soil vapor test results: influent rate 300 scfm throughout; maximum influent concentration = 100 ppmv VOC, 0.76 ppmv benzene; destruction efficiency = 97% throughout.

Emissions of Precursor Organics:

$$100\text{E-}6 * \frac{300 \text{ ft}^3}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{28.32\text{L}}{1 \text{ ft}^3} * \frac{1 \text{ mole}}{24.15\text{L}} * \frac{100\text{g}}{\text{mole}} * \frac{1 \text{ lb}}{454\text{g}} * (1 - 0.97) = \mathbf{0.335 \text{ lb/day}} \text{ (abated)}$$

Emissions of Toxic Air Contaminants (benzene):

$$0.76\text{E-}6 * \frac{300 \text{ ft}^3}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{28.32\text{L}}{1 \text{ ft}^3} * \frac{1 \text{ mole}}{24.15\text{L}} * \frac{78\text{g}}{\text{mole}} * \frac{1 \text{ lb}}{454\text{g}} * (1 - 0.97) = \mathbf{0.002 \text{ lb/day}} \text{ (abated)}$$

Emissions of Toxic Air Contaminants (S-1):

	(ppmv)	Emission (lb/day) (unabated)	Emission (lb/day) (with abated)	Emission (lb/yr) (with abated)
Benzene	0.76	0.07	0.002	0.73
Toluene	1.2	0.12	0.004	1.36
Ethyl-benzene	1	0.12	0.004	1.30
Xylenes	2.8	1.00	0.030	10.93
TPH	100	11.19	0.3358	122.55

S-2: Ground Water Treatment System

Assumptions:

- * Contaminant concentrations in ground water: 4.7 ppmw benzene (based on groundwater sampling results provided by Environmental Compliance Group, LLC).
- * Emission factors based on manufacturer guarantees. Limiting factor is the pump capacity of 10 gal/min. Liquid phase hydrocarbon removal efficiency of stripper = 100%. Liquid flow rate = 10 gal/min.

Emissions of Toxic Air Contaminants (benzene) (S-2):

$$4.7E-6 * \frac{10 \text{ gal}}{\text{min}} * \frac{1440 \text{ min}}{1 \text{ day}} * \frac{8.337 \#}{1 \text{ gal}} * (1.0) * (1 - 0.97) = \mathbf{0.017 \text{ lb/day}} \text{ (abated)}$$

Emissions of Toxic Air Contaminants (S-2):

	(µg/L)	(ppmw)	Emission (lb/day) (unabated)	Emission (lb/day) (with abated)	Emission (lb/yr) (with abated)
Benzene	4700	4.7	0.56	0.017	6.18
Toluene	1800	1.8	0.22	0.01	2.37
Ethyl-benzene	1800	1.8	0.22	0.01	2.37
Xylenes	3200	3.2	0.38	0.01	4.21
TPHg	31000	31	3.72	0.1117	40.77

Total Benzene Emissions (S-1) & (S-2):

$$0.73 \text{ lb/year (S-1)} + 6.18 \text{ lb/year (S-2)} = 6.91 \text{ lb/year}$$

The benzene emission is above the trigger levels listed in Regulation 2-5, Table 2-5-1; the trigger level for benzene is 3.8 pound/ year. Therefore Health Risk Screening Analysis was prepared.

Highest Daily Emissions	=	0.447 lb/day
Annual Average	=	0.447 lb/day
RFP	=	0.082 tons/yr

Secondary Emissions:

From District's Permit Handbook Chapter 9.2:

Reasonably Available Control Technology (RACT) for thermal oxidation:

NOx = 0.2 lb/MMBTU

CO = 0.8 lb/MMBTU

Emission factors from AP-42, Table 1.4-2 (Natural Gas Combustion):

PM10 = 0.075 lb/MMBTU

SO2 = 0.0006 lb/MMBTU

POC = 0.0054 lb/MMBTU

The annual emission from the proposed thermal oxidizer (400,000 BTU/hr)

$$Es = F \times B \times H$$

Where:

Es = Annual emissions for abatement device (lbs/yr)

F = Emission Facotr of Criteria Pollutant (lb/MMBTU)

B = Maximum Firing Rate of Burner in Abatement Device (MMBTU/hr)

H = Maximum Number of Hours the oxidizer will operate = (24 hr/day x 365 day/yr = 8760 hrs/yr)

Pollutant	F	B	H	Es = F x B x H		
	lb/MMBTU	MMBTU	hrs	lb/yr	tons/yr	lb/day
NOx	0.2	0.4	8760	700.8	0.350	1.92
CO	0.8	0.4	8760	2803.2	1.402	7.68
PM10	0.75	0.4	8760	2628	1.314	7.2
SO2	0.0006	0.4	8760	2.1	0.001	0.006
POC	0.0054	0.4	8760	18.9	0.009	0.052

The annual emission from the proposed carbon adsorption system

There are no secondary emissions for the operation of carbon adsorption system.

Toxics

Under the trigger levels as per Regulation 2-1-316, the emissions of toxic substances (Benzene) are considered sufficient to warrant a Risk Screen Analysis. Benzene trigger = 0.01 lb/day. A Health Risk Screen was performed for this application to determine the risk to the maximally exposed industrial and residential receptors. The ISCST3 air dispersion models were used to estimate the pollutant concentrations in the area surrounding the site for a unit emission rate. It was determined that benzene emissions as calculated above corresponded to a risk of 0.6 in a million to the maximally exposed industrial receptor. This emission rate would result in maximum risk of 10 in a million to the maximally exposed residential receptor. This source is unlikely to cause an acute risk for benzene emissions, as the hourly trigger for benzene is 2.9 pounds per hour. In accordance with the District's Regulation 2-5, the impact is then insignificant since this risk is within the threshold of 10 in a million as required for sources implementing TBACT; therefore, the Toxics Section has recommended the issuing of this A/C with a Benzene emission limit of 0.051 lb/day.

New Source Review

This proposed project will not emit over 10 lbs per highest day and is therefore not required to implement BACT. For Soil Vapor Extraction operations, BACT is defined as attainment of set destruction efficiencies corresponding to set influent concentration values. Operation of the Thermal/Catalytic Oxidizer, I.C.E., and the Carbon vessels will be conditioned to ensure attainment of the following required destruction efficiencies: $\geq 98.5\%$ if inlet POC ≥ 2000 ; $\geq 97\%$ if inlet POC ≥ 200 to < 2000 ppmv; $\geq 90\%$ if inlet POC < 200 ppmv. Offsets need not be imposed as annual emissions will not exceed 10 tons.

CEQA

The project is considered to be ministerial under the Districts proposed CEQA Regulation 2-1-311 and therefore is not subject to CEQA review. The engineering review for this project requires only the application of standard permit conditions and standard emission factors and therefore is not discretionary as defined by CEQA. This project is in compliance with Chapters 9.1 & 9.2 of the permit handbook.

Compliance

Based on the information submitted, this operation is expected to be in compliance with Regulation 8-47-301, Emission Control Requirements, Specific compounds, and 8-47-302, Organic compounds. The POC emissions will be vented through a Thermal Oxidizer, Catalytic Oxidizer, or Carbon adsorption system at all times of operation. This project is within 1,000 feet from the nearest public school and is therefore subject to the public notification requirements of Regulation 2-1-412.

Recommendation

Recommend that a conditional Authority to Construct be issued for sources:

- S-1: Soil Vapor Extraction System consisting of a 300 max scfm vacuum blower, and ancillary equipment, abated by A-1, SVE Abatement System, consisting of either a Thermal Oxidizer, Catalytic Oxidizer, or at least two (200 lb minimum capacity) Carbon Adsorption Vessels arranged in series.
- S-2: Groundwater Treatment System consisting of a 10 gpm max capacity Air Stripper, and ancillary equipment, abated by A-1, SVE Abatement System, consisting of either a Thermal Oxidizer, Catalytic Oxidizer, or two (200 lb minimum capacity) Carbon Adsorption Vessels arranged in series.

Conditions

1. The owner/operator shall abate the Precursor Organic Compound (POC) emissions from Sources S-1 and S-2 shall be abated by A-1, SVE Abatement System, consisting of either a Thermal Oxidizer, Catalytic Oxidizer, or two (200 lbs minimum capacity) Activated Carbon Vessels during all periods of operation. Start-up and subsequent operation of each abatement device shall take place only after written notification of same has been received by the District's Engineering Division. The owner/operator shall operate the sources such that the soil vapor flow rate from S-1 shall not exceed 300 scfm and the groundwater flow rate into S-2 shall not exceed 10 gpm. [Basis: Cumulative Increase, Regulation 8-47-301 and 302, TBACT]
2. For each of the first three days of operation of the airstripper, the owner/operator shall collect and analyze at least one influent groundwater sample. The owner/operator shall collect and analyze at least one sample thereafter for each calendar month of operation. The owner/operator shall collect samples in accordance with the Regional Water Quality Control Board's analytical methods. [Basis: Regulation 8-47-601]
3. The owner/operator shall operate A-1 Thermal Oxidizer such that the POC abatement efficiency shall be maintained at a minimum of 98.5% by weight for inlet POC concentrations greater than or equal to 2000 ppmv (measured as hexane). For inlet concentrations below 2000 ppmv and greater than or equal to 200 ppmv, a minimum abatement efficiency of 97% shall be maintained by the owner/operator. For inlet concentrations below 200 ppmv, a minimum abatement efficiency of 90% shall be maintained by the owner/operator. The minimum abatement efficiency shall be waived if outlet POC concentrations are shown to be less than 10 ppmv (measured as hexane). In no event shall the owner/operator emit benzene emissions to the atmosphere exceeding 0.051 pounds per day. [Basis: Cumulative Increase, Regulation. 2-5, TBACT]
4. While operating as a Thermal Oxidizer, the owner/operator shall not operate A-1 below a minimum operating temperature of less than 1400 degrees Fahrenheit. While operating the Catalytic Oxidizer, the owner/operator shall not operate A-1 below a minimum operating temperature of 600 degrees Fahrenheit. [Basis: Cumulative Increase, Regulation 2-5, TBACT]
5. To determine compliance with part 4, the owner/operator shall equip the A-1 Thermal/Catalytic Oxidizer with continuous measuring and temperature recording instrumentation. The owner/operator shall collect and maintain the temperature data from the temperature recorder in a file which shall be available for District inspection for a period of at least 2 years following the date on which such data are recorded. [Basis: Regulation 1-523]
6. To determine compliance with part 3, within ten days after start-up of the Thermal Oxidizer, and within ten days after start-up of the Catalytic Oxidizer, the owner/operator of this source shall:
 - a. Analyze inlet gas stream to determine the flow rate and concentration of POC present.
 - b. Analyze exhaust gas to determine the flow rate, and the concentration of benzene and POC present.
 - c. Calculate the benzene emission rate in pounds per day based on the exhaust gas analysis and the operating exhaust flow rate. The owner/operator shall decrease the soil vapor flow rate, if necessary to demonstrate compliance with part 2.

- d. Calculate the POC abatement efficiency based on the inlet and exhaust gas analysis. For the purpose of determining compliance with part 2, the owner/operator shall report the POC concentration as hexane.
- e. Submit to the District's Engineering Division the test results and emission calculations within one month from the testing date. The owner/operator shall analyze samples according to modified EPA test methods 8015 and 8020 or their equivalent to determine the concentrations of POC and benzene.

[Basis: Cumulative Increase, Regulation 2-5, TBACT]

7. The owner/operator of this source shall maintain the following records for each month of operation of the Thermal Oxidizer or Catalytic Oxidizer:
 - a. Days and hours of operation.
 - b. Each emission test, analysis or monitoring results logged in for the day of operation they were taken.
 - c. Total throughput of soil vapor from source S-1 in Standard Cubic Feet.
 - d. Total throughput of groundwater through Source S-2 in thousands of gallons.

Such records shall be retained and made available for inspection by the District for two years following the date the data is recorded. [Basis: Regulation 1-523]

8. During operation of the Activated Carbon Vessels, the owner/operator of this source shall monitor with a photo-ionization detector (PID), flame-ionization detector (FID), or other method approved in writing by the District's Source Test Manager at the following locations:
 - a. At the inlet to the second to last Carbon vessel in series.
 - b. At the inlet to the last Carbon vessel in series.
 - c. At the outlet of the Carbon vessel that is last in series prior to venting to the atmosphere.

When using an FID to monitor breakthrough, readings may be taken with and without a Carbon filter tip fitted on the FID probe. Concentrations measured with the Carbon filter tip in place shall be considered methane for the purpose of these permit conditions. [Basis: Cumulative Increase, Regulation 2-5, TBACT]

9. The owner/operator shall record these monitor readings in a monitoring log at the time they are taken. The owner/operator shall use the monitoring results to estimate the frequency of Carbon change-out necessary to maintain compliance with parts 10 and 11, and shall be conducted on a daily basis. The owner/operator of this source may propose for District review, based on actual measurements taken at the site during operation of the source, that the monitoring schedule be changed based on the decline in organic emissions and/or the demonstrated breakthrough rates of the carbon vessels. Written approval by the District's Engineering Division must be received by the owner/operator prior to a change to the monitoring schedule. [Basis: Cumulative Increase, Regulation 2-5, TBACT]
10. The owner/operator shall immediately change out the second to last Carbon vessel with unspent carbon upon breakthrough, defined as the detection at its outlet of the higher of the following:
 - a. 10 % of the inlet stream concentration to the carbon bed.
 - b. 10 ppmv (measured as hexane).[Basis: Cumulative Increase, Regulation 2-5, TBACT]
11. The owner/operator shall immediately change out the last Carbon vessel with unspent Carbon upon detection at its outlet of 10 ppmv (measured as hexane). [Basis: Cumulative Increase, Regulation 2-5, TBACT]

12. The owner/operator of this source shall maintain the following information for each month of operation of the Activated Carbon Vessels:
 - a. Hours and time of operation.
 - b. Each emission test, analysis or monitoring results logged in for the day of operation they were taken.
 - c. The number of Carbon vessels removed from service.
 - d. Total throughput of soil vapor from source S-1 in Standard Cubic Feet.
 - e. Total throughput of groundwater through Source S-2 in thousands of gallons.

Such records shall be retained and made available for inspection by the District for two years following the date the data is recorded. [Basis: Regulation 1-523]

13. The owner/operator shall report any non-compliance with these conditions to the Compliance and Enforcement Division at the time that it is first discovered. **The owner/operator shall detail the corrective action taken and include the data showing the exceedance as well as the time of occurrence in the submittal.** [Basis: Cumulative Increase, Regulation 2-5, TBACT]
14. The owner/operator shall maintain a file containing all measurements, records and other data that are required to be collected pursuant to the various provisions of this conditional Authority to Construct/Permit to Operate. All measurements, records and data required to be maintained by the owner/operator shall be retained for at least two years following the date the data is recorded. [Basis: Regulation 1-523]
15. Upon final completion of the remediation project, the operator of Sources S-1 and S-2 shall notify the Engineering Division within two weeks of decommissioning the operation. [Basis: Cumulative Increase, Regulation 2-5, TBACT]

by _____ date _____

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